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A.D. 1815 . . . . N° 3905.

SPECIFICATION

OF

WILLIAM LOSH.

FURNACES FOR OVENS, STEAM BOILERS, &c.

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LOSH'S SPECIFICATION.

TO ALL TO WHOM THESE PRESENTS SHALL COME, I, William Losh, of Point Pleasant, in the Parish of Wallsend, in the County of Northumberland, Iron Founder, send greeting.

WHEREAS His most Excellent Majesty King George the Third, by His Letters Patent under the Great Seal of the United Kingdom of Great Britain and Ireland, bearing date at Westminster, the Eighth day of April, in the fifty-fifth year of His reign, did give and grant unto me, the said William Losh, my ex̃ors, adm̃ors, and assigns, His especial license, full power, sole privilege and authority, that I, the said William Losh, my ex̃ors, adm̃ors, and assigns, and every of them, during the term of fourteen years therein expressed, should and lawfully might make, use, exercise, and vend, within that part of the United Kingdom of Great Britain and Ireland called England, the Dominion of Wales, and Town of Berwick upon Tweed, in such manner as to me, the said William Losh, my ex̃ors, adm̃ors, and assigns, or any of them, should seem meet, my Invention of "A New Plan for Fire-places or Furnaces for Heating Ovens and Boilers, and the Water or other Liquids contained in such Boilers, and for Converting such Water or other Liquids into Steam for the Purpose of Working Engines, and for other Uses in Manufacture;" in which said Letters Patent there is contained a proviso obliging me, the said William Losh, by an instrument in writing under my hand and seal, to cause a particular description of the nature of my said Invention, and in what manner the same is to be performed, to be inrolled in His said Majesty's High Court of Chancery within two calendar months after the date of the said recited Letters Patent, as in and by the same, reference being thereunto had, will more fully and at large appear.

NOW KNOW YE, that I, the said William Losh, in compliance with the said proviso, do hereby describe and ascertain the nature of my said Invention, and in what manner the same is to be performed, as follows, reference being had to the Drawings in the schedule hereunto annexed, that is to say:—

The principles upon which I ground my improvement consist in the application of the caloric and heated gases evolved during the combustion of any substance free from admixture with and free from the cooling influence of any cold undecomposed atmospheric air, or any other air which has not passed through the ignited fuel, to such parts of the vessel and material required to be heated as I wish to expose to the undiminished action of such caloric and heated gases, and the more equable and sudden application of such caloric and heated gases to such parts of the vessel as are intended to be submitted to their influence; and also in the case of large boilers, salt pans, &c., in the facility which the arrangement of my fire-places or furnaces afford of giving an effectual support to the bottom and such parts of the vessel as require it without lessening the action of the heated air. The plan upon which I proceed in the case of boilers is to place the furnace or bars on which the fuel is burnt nearly under the centre or middle of the boiler bottom, provided I only employ one fire, or provided I think more than one furnace or fire more efficacious, in such other situations as that the heated gases shall act as equably as possible on the surface to be heated, and to have the aperture or apertures for the escape of the rarified air, smoke, and gases from the grate room or space in which they are generated at or above the door or aperture through which the fuel is put in, or so near to it as that the heated air and gases, by their expansive force and diminished specific gravity, shall prevent the cold air of the atmosphere from penetrating beneath the bottom of the boiler or to such parts of it as are required to be exposed to the action of the heated air and gases alone, and so that, provided a chimney be required to produce a more rapid combustion, any cold air that may penetrate at the door or aperture through which the fuel is introduced, either when open or closed, shall, in its passage to the chimney, have no tendency to mix with the heated gases until after they have ceased to act on such parts of the boiler and other substances as are required to be subjected to their action alone. A division of cast metal plates or other convenient substance, extending from the ends of the bars or furnace next the door, separates the grate room or space containing the heated gases from the ash-hole and air duct, and prevents any air from penetrating into the grate room which does not pass through the ignited fuel. To prevent the cooling influence of the air passing under these plates they may be covered with fire-brick or any fit substance which is a bad conductor of heat, or which transmits it slowly. In heating common vaulted ovens the grates or furnaces are placed a little below or on a level or nearly so with the bottom, and the ash-hole through which the air enters to keep up the combustion of the fuel may proceed from any side of the oven most convenient, but it must be so covered by the bottom of the oven that no air can enter by it which does not pass through the burning fuel, and the heated air and gases, after having acted on the roof, sides, and bottom of the oven free from admixture with and free from the cooling influence of any other air, are allowed to escape into the atmosphere in the manner described above, either by the door through which the fuel is put in or through apertures sufficiently near it to prevent the penetration of cold air into the body of the oven. When the oven is sufficiently heated the ash-hole leading to the grates must be closed either by a door made air-tight by a luting of clay and loom, or any other fit substance, or by any other method, and the fire must be drawn off the bars, which may be covered with a plate or flag to increase the capacity of the oven for holding bread, &c., and the ignited fuel being drawn out, the remainder of the process of baking is managed as usual. When it is required to heat a cylindrical, square, or other shaped oven, either for the purpose of baking and cooking food or for the purposes of manufacture, such as those used for calcining coal into coak and for obtaining coal tar and the inflammable gases used for the production of light, the gases evolved from the fuel employed to heat such ovens are allowed to pervade every part of them, or nearly so, except the mouth or part at which they are charged with the material required to be baked, cooked, or calcined, after which they are allowed to escape only at the aperture through which the fuel is introduced, or so near to it that no air which has not passed through the burning fuel shall have any tendency to enter the grate room, or come in contact with such parts of the oven as are required to be exposed to the action of the heated gases alone. In applying my principle to the small vaulted brick ovens used almost by every family in the northern counties of England, and to the large vaulted ovens of bread bakers, my objects, added to the saving in quantity of fuel, and to enable them to be heated with small or refuse coals, and to produce that effect in a very short time and with little trouble. The chamfer used by the bakers in Edinburgh is an engenious contrivance, but is troublesome on a small scale, and the tube which conveys a constant succession of cold air through the body of the oven to keep up the combustion has a considerable influence in retarding its heating; besides it requires large coals. The advantages resulting from my arrangement are, first, the saving of the boilers and ovens themselves, and the iron and other metals employed in their erection; and, secondly, the saving of the fuel employed for heating them; and, thirdly, a more constant and steady evaporation of any fluid, and consequently a more regular and constant supply of steam for giving motion to machinery, or for the supply of heat, or for any other purpose. The first object is attained by preventing a current of cold undecomposed atmospheric air from penetrating along with the heated gases beneath the boilers or other vessels, or to such parts of them as are required to be exposed only to the heated gases, or in the case of alum pans, &c., beneath the plates on which they rest; for, on the usual principle, where a current of cold air is at intervals, if not constantly, mixing with the heated air and gases employed to heat any boiler or other vessel, in order to supply the loss or diminution of heat occasioned by this admixture of cold air, it is necessary, in order to produce a given effect, to generate a much greater quantity of heat, or, in other words, to have a much larger fire than is required according to my principle, where the heated gases act with uniform and undiminished intensity; thus the bars are continually exposed to a much more intense heat when the fire-places are constructed on the usual plans than is necessary when my principle is adopted, and the known effect of this excessive heat is the speedy destruction of the bars and other materials used in the construction of the fire-places or furnaces. The irregular action of the heated gases and their very unequal diffusion over the surface of the boiler have also a great tendency to destroy the material of which it is composed. On the usual plan of heating a steam-engine boiler, for instance, in order to maintain the steam at a sufficient degree of expansive force or power to work an engine on Messieurs Boulton and Watt's principle, the fire which is requisite is so intense as to flux much of the incombustible matter of the fuel into slags or large masses of scoria, and frequently to fuse the bars on which the fuel burns even under the management of a careful fireman, and where engines are used which require the steam at a much higher temperature of course these evils are increased, but where my principle is adopted these disadvantages are avoided. When undecomposed atmospheric air comes in contact with iron and some other metals at a high degree of heat it has the effect of oxidating their surfaces both by its own decomposition and by that of the water, which it always carrys with it, and these oxidated surfaces seperate in successive coats of scales till by degrees the metal is entirely corroded away; thus I gain another advantage by the exclusion of the undecomposed air of the atmosphere. By the position of my furnaces I am also enabled to give a more effectual support to the bottoms of the boilers than is practicable in the usual modes of heating them (as is shewn in the annexed plans), and thus I prevent their yielding to the weight of water and other fluids and to the pressure of the steam, which in steam-engine boilers particularly often occurs, and is attended with much expence in the repairs and with great risk to the people who work them. The more equable distribution of heat, and particularly the impossibility of a sudden access of cold air to the heated vessels on opening the fire door to add fuel or to check the ebullition, also tends much to lessen the liability of cracking in cast metal boilers, which is generally the effect of a sudden variation of temperature. The steady and regular action of the heat when boilers are placed on my principle gives so uniform a degree of elasticity to the steam that an engine with such a boiler will never miss a stroke for want of steam of sufficient expansive power. The action of the heated gases is so powerful when boilers are placed on my plan, and the steam is generated with such rapidity, that a boiler which was calculated to work a large pumping engine at Wallsend Colliery, in the County of Northumberland, on the usual plan, having been put up under my direction, not only works the engine with facility, with an immense saving of fuel, but seems to be capable of supplying steam to work another engine of equal power. Thus it appears that the saving in the boiler and materials connected with its erection is not alone confined to the wear and tear of such boiler and materials, but that boilers of much less dimensions than those usually employed to produce a given effect will answer the purpose when placed on my construction. The second intention (the saving of fuel) I accomplish by a more regular and sudden distribution of the caloric and heated gases generated by the burning fuel over the surface to be heated, and by preventing their admixture with cold atmospheric air, which in the usual modes of placing boilers always takes place, and from the known law of the equal distribution of caloric, considerably weakens their effect by combining with and carrying of a part of that substance which otherwise would be, and according to my plan is, transmitted through the boilers, &c., and to the liquids or other substances they contain. According to my plan, the caloric and heated gases ascend and radiate from the burning fuel, and impinge against the boiler or other substance required to be heated with extreme velocity and intensity, as they meet with no substance to direct them from their course, or to which they can impart a portion of their heat. In the common plans, on the contrary, where a current of cold air is forced through the grate room in its passage to the chimney, the heated gases are not only bent from their course but deprived of a considerable portion of their heat, and as they do not come in contact but with a small proportion of the boiler until they have been forced over an area of brickwork or other substance and through a long extent of flues, much more of this most active and penetrating substance must be lost to the vessel intended to be heated and expended in the tendency which the gases have to raise to their own temperature the substances with which they come in contact. It is obvious that in the usual plans of placing boilers, &c. the admixture of cold air with the heated gases must occur during each fresh supply of fuel, and even while the doors are shut it does not cease to go on, to a greater or lesser extent, as from the nature of things it is next to an impossibility to make a fire door air-tight, and if that were possible, the heat to which they are exposed would by warping and twisting them soon destroy their accuracy. Fire mouths or hopper-shaped apertures, which are closed with coal after each supply of fuel, also allow the air to penetrate through thousands of interstices between the fragments of coal with which they are filled. The time necessarily allowed between the granting of a Patent and preparation of the Specification does not allow of many experiments on a great scale, from which alone accurate results can be given, but I have reason to believe that the saving of fuel when boilers, &c. are placed on my construction, compared with boilers, &c. placed on the most approved plan hitherto suggested, will be found to exceed one half, and I think the saving of the boilers, bars, &c. will be nearly in the same ratio. I do not speak from small experience of former plans, for in a chemical work of which I have had the management for upwards of fifteen years, and where more than thirty boilers of different dimensions, including salt pans and steam-engine boilers, are employed, and where there are a variety of calcine ovens, retorts, furnaces, &c., it has of course been an object with me to economise fuel, and I have in consequence tried a variety of schemes which have been suggested to me for that effect, both in this country and in most of the large towns on the Continent, where I have occasionally resided. As instances of the steady, rapid, and intense action of furnaces on my construction, a round boiler of thirteen feet diameter, without any tube through it, was not only brought to boil but furnished steam of sufficient power to work a machine of twenty horses power, put up by Messieurs Boulton and Watt, in eight minutes from the time that it was filled sufficiently high with water, the fire being put in when the bottom was covered, and which engine was at work within the space of seventeen minutes from the time of its being filled with water. A similar boiler placed on the usual construction required an hour and a quarter to raise the steam to the same degree of elasticity as a boiler of my construction produced within eight minutes after it was filled above the flues, the fire being put in when the bottom was covered, and as it was a competition of skill every possible exertion would be used on both sides. A vaulted brick oven of five feet four inches diameter, constructed according to my principle, was from a cold state brought to a sufficient heat to bake bread in one hour and a quarter with four shovels of small coals. An oven of the same kind, on the common plan, of three feet ten inches diameter only, required five hours, kept the whole time full of wood and round coals. As the fuel required to heat any vessel on my principle is less than half of what is employed to produce the same effect in vessels placed on the usual plans, and as a much greater proportion of the smoke arising from a given quantity of fuel is consumed by furnaces constructed on my plan, the quantity of that substance thrown into the atmosphere is exceedingly diminished, and by the introduction of a small cinder fire in the flues leading to the chimney, the black matter of the smoke, which is very inflammable, might be nearly wholly consumed. In the annexed schedule I have delineated eighteen Drawings of the fire-places or furnaces for heating ovens and boilers. Figure 1 represents a vertical section of an engine boiler and furnace where the cold air is entirely prevented from mixing with the heated gases until after they have ceased to act in the boiler. Figure 2 represents an horizontal section of the same taken at the line B, B. Figure 3 represents another horizontal section of the same taken at the line A, A. *a*, a wall which extends from the bottom of the ash-hole to the bottom of the boiler and to the top of the flues or space for containing the heated air round the sides of the boiler. This wall cuts off all communication between the two furnaces and grate rooms or spaces for containing the heated gases, and gives support to the bottom and sides of the boiler. *b* shews the grates or bars on which the fuel is burnt; *c*, a plate of metal or other fit substance which seperates the ash-hole and grate room, and prevents the ascent of the atmospheric air from the former to the latter; *d*, the door frame; *e*, the door; *f*, *f*, pillars on which the boiler rests, with a bearance of nine inches (more or less according to the size of the boiler) within the extreem periphery of the bottom; *g*, caps or covers of cast metal for the pillars; *h*, the boiler; *i*, *i*, the spaces round the sides of the boiler into which the heated air ascends from the grate room through the opening *l* between the pillars *f*, *f*; *j*, a wall surrounding the spaces *i*, *i*; *k*, spaces through which the heated gases after acting on the boiler take their exit from the grate room to the chimneys, which may rise immediately above each fire door, or the heated gases and smoke may be conveyed through flues to one chimney placed in any convenient situation, as shewn on the plan, Figure 3. Figure 4 represents a vertical section of a steam engine boiler, where the cold air of the atmosphere is prevented from mixing with the heated gases until after they have ceased to act on the bottom of the boiler. *a*, *b*, *c*, *d*, *e*, are explained in Figures 1, 2, and 3; *f*, a wall on which the boiler bottom has a bearance of nine inches, more or less; *i*, *i*, *i*, *i*, flues, into which the heated air, smoke, &c., ascend from the grate room at *g*, *g*, *g*, *g*, in Figure 5; *j*, outside wall. Figure 6 represents a vertical and longitudinal section of a boiler and furnace for a locomotive or travelling engine, or for any engine on Mr Trevithick's principle, in which my plan of applying the heated gases free from mixture with the cold atmospheric air is adopted. Figure 7 represents a transverse section of the same; *a, a, a, a,* shew the exterior of the boiler; *b, b, b, b,* the tube in which the furnaces are placed; *c, c, c,* are the furnace bars; *d, d,* plates or divisions which prevent the penetration of the air from the ash-hole and air duct into the grate room; *e,* a partition between the two furnaces; *f, f,* chimneys; *g, g,* fire doors. Figure 8 represents a longitudinal and vertical section of an alum pan where the penetration of cold air into the grate room is prevented during the process of working. Figure 9 represents a plan of the furnaces, &c., of the same. Figure 10 represents a transverse section of a alum pan; *a, a, a, a,* shew the pan; *b, b, b, b,* the plates on which the pan rests; *c, c, c, c,* the grate bars; *d, d,* the plates between the ash-hole and grate room; *e, e,* the doors; *f, f,* walls which seperate the furnaces; *g, g,* the chimneys. On this plan, salt pans, copperas boilers, and other similar boilers may be constructed, varying the size and number of the furnaces according to the area of the bottom of the boiler, and the degree of heat required to be generated. A parellellogram-shaped or an oblong steam engine boiler, the bottom of which, at its corners or laggons, or the curved plates which connect the sides with the bottom, should be supported on pillars, with openings between them to admit the ascent of the heated gases from the grate room to the space for containing the heated air in contact with the sides of the boiler (as shewn in Fig. 1) placed above. Such an arrangement of furnaces would have a very powerful effect in raising steam, and if a tube was introduced in such a boiler, it would add much to the surface on which the heated air would act, and of course, much to its effect in generating steam. Figure 11 represents a vertical section of a bleacher's or calico printer's boiler, where the cold air is entirely prevented from mixing with the heated gases until after they have ceased to act on the boiler. Figure 12 represents an horizontal section of the same at the line A, A. Figure 13 represents a transverse section of the furnace of the same, &c.; *a, a, a, a, a, a,* shew the boiler; *b, b,* the grates or bars on which the fuel is burnt; *c,* a plate or partition which separates the ash-hole from the grate room; *d,* the door frame; *e,* the door; *f, f, f, f, f,* the pillars on which the boiler rests with a bearance of six inches less or more; *g, g, g, g,* the space surrounding the sides of the boiler, into which the heated air ascends from the grate room through the openings between the pillars; *h,* the chimney.

FIG. 3. *Horizontal Section of Fig 6 at AA.*

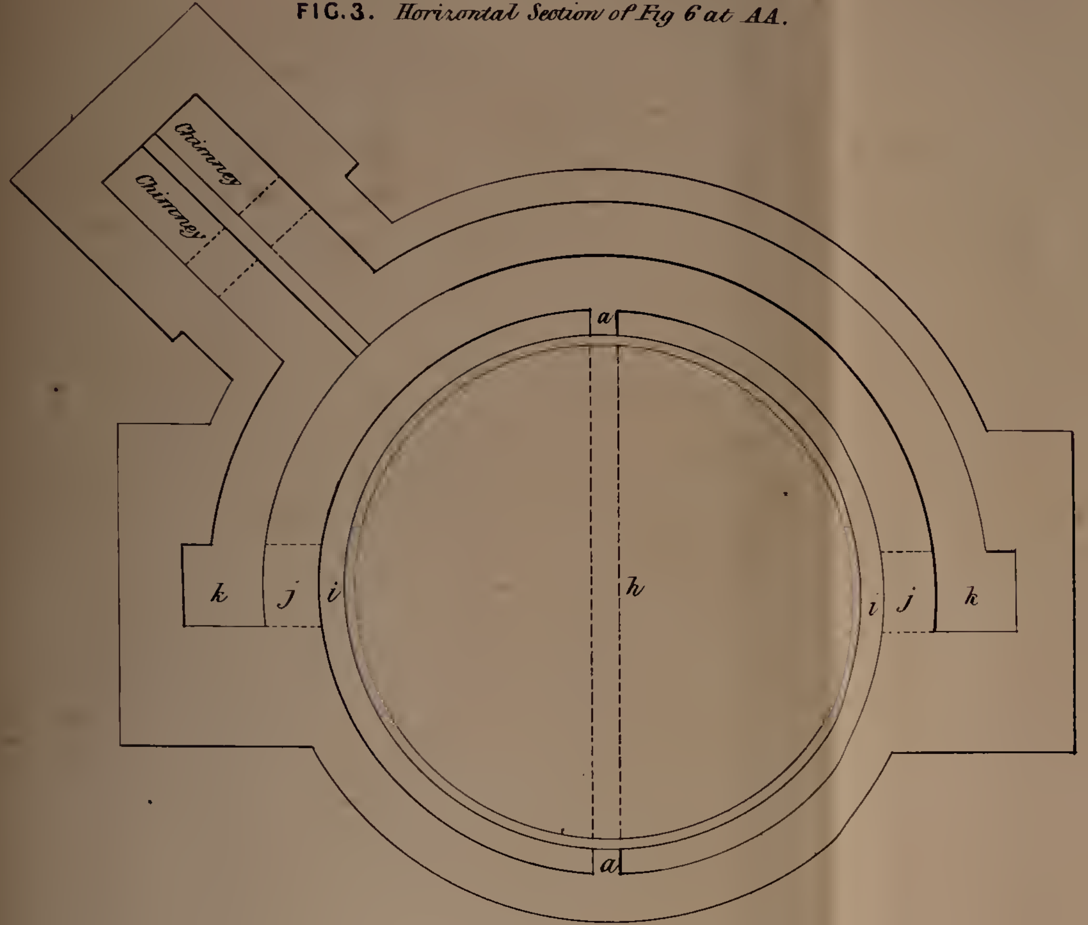


FIG. 2. *Horizontal Section of Fig 4 at BB.*

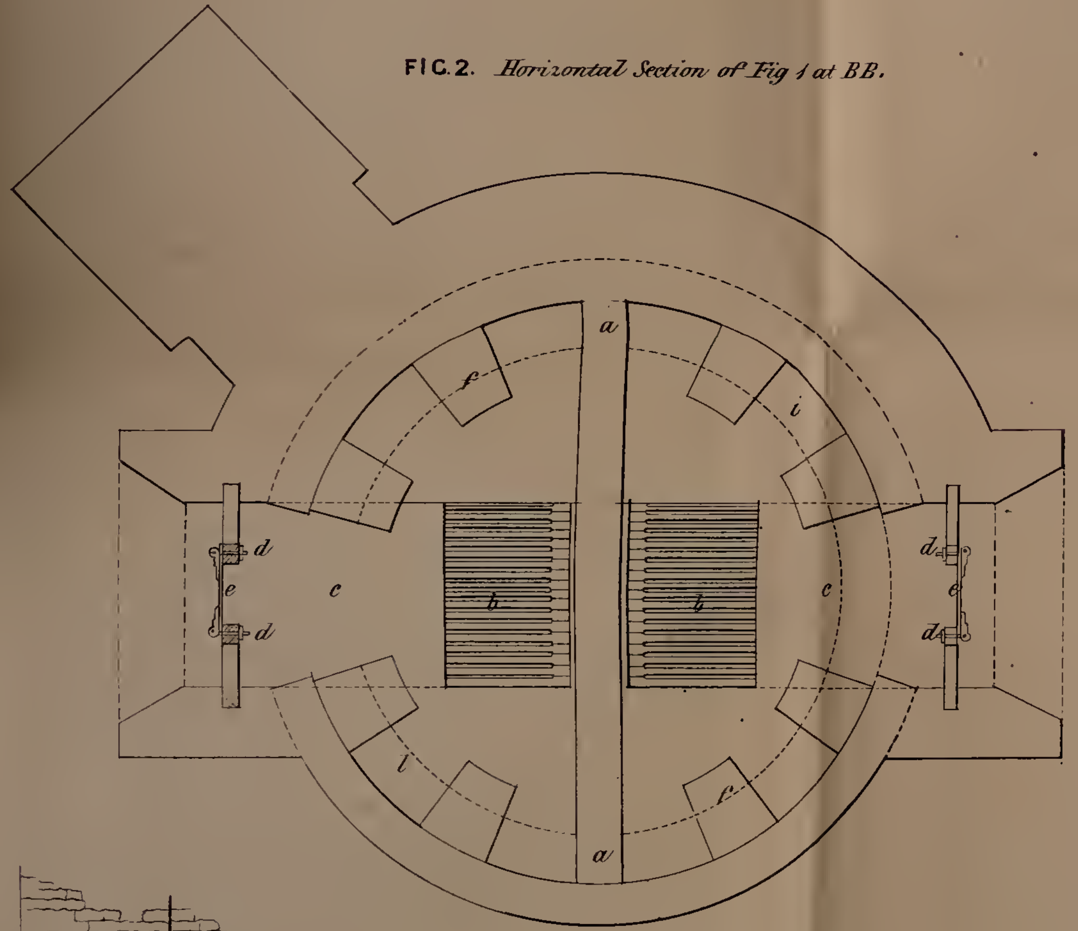
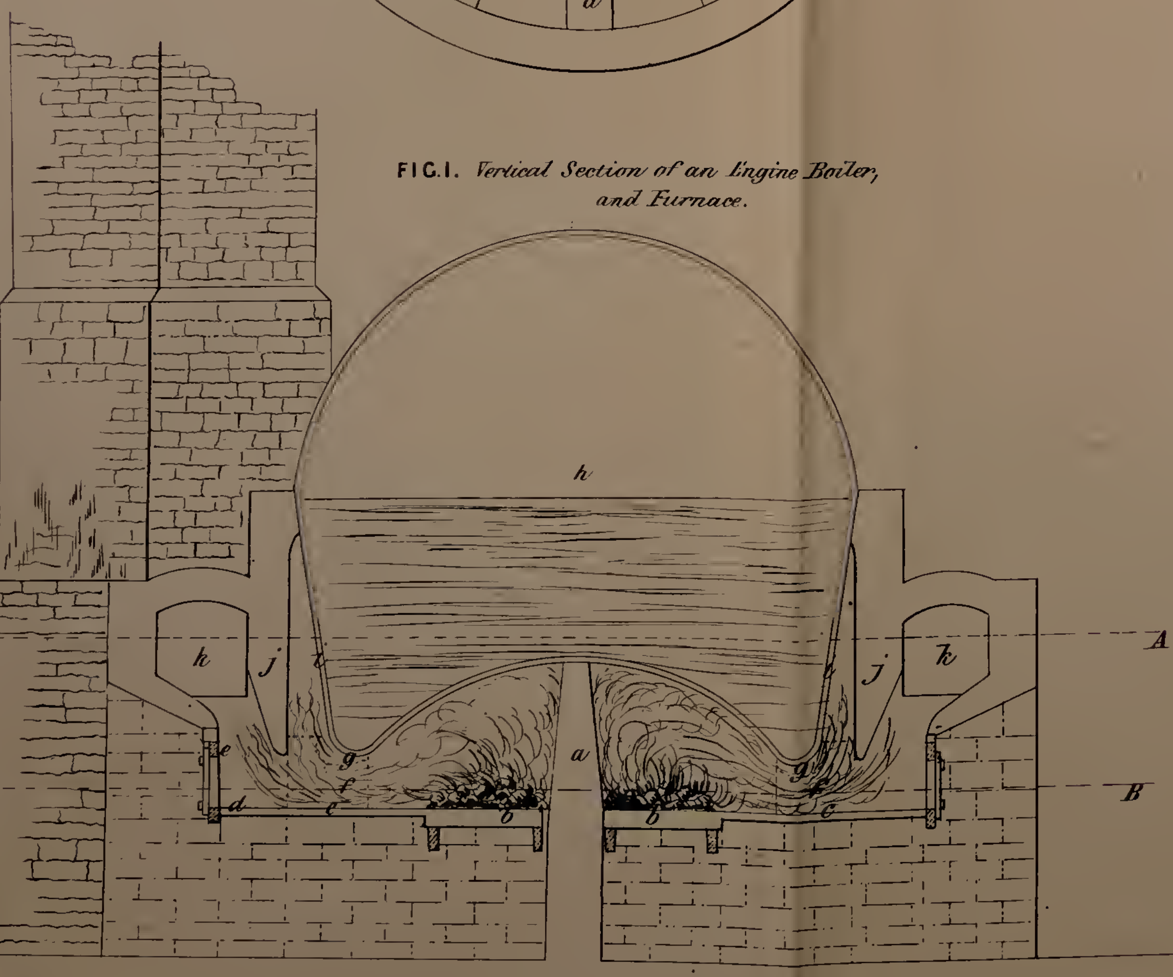


FIG. 1. *Vertical Section of an Engine Boiler, and Furnace.*



Scale ¾ in. to a foot.

FIG. 7. *Transverse Section of Fig 6.*

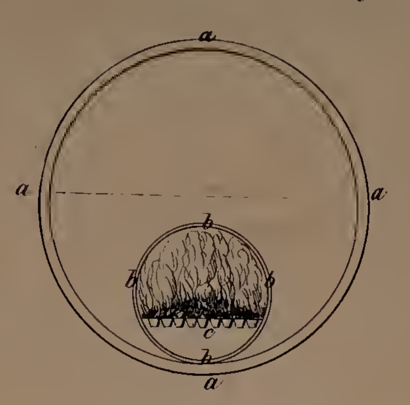
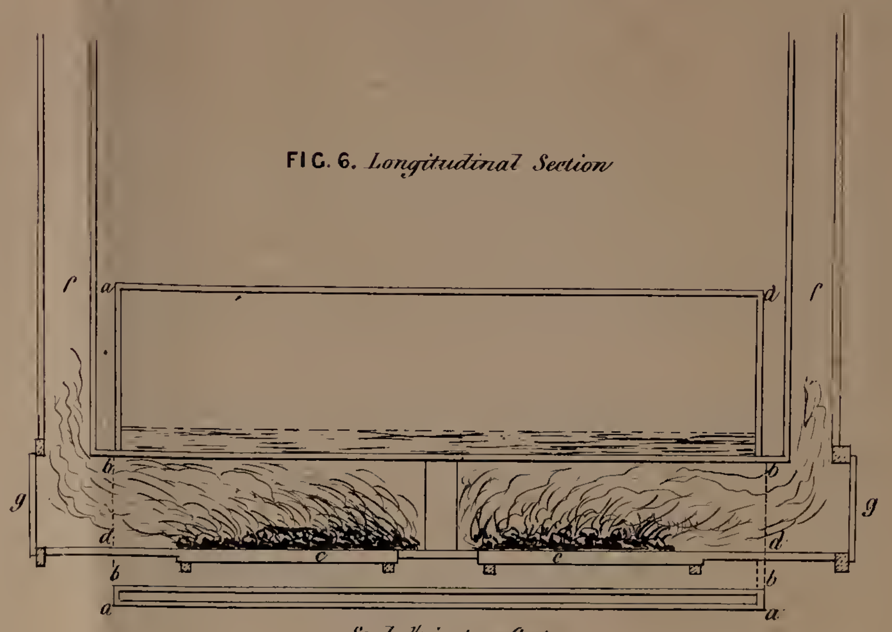


FIG. 6. *Longitudinal Section*



Scale ½ in. to a foot.

FIG. 5. *Horizontal Section of Fig 4 at*

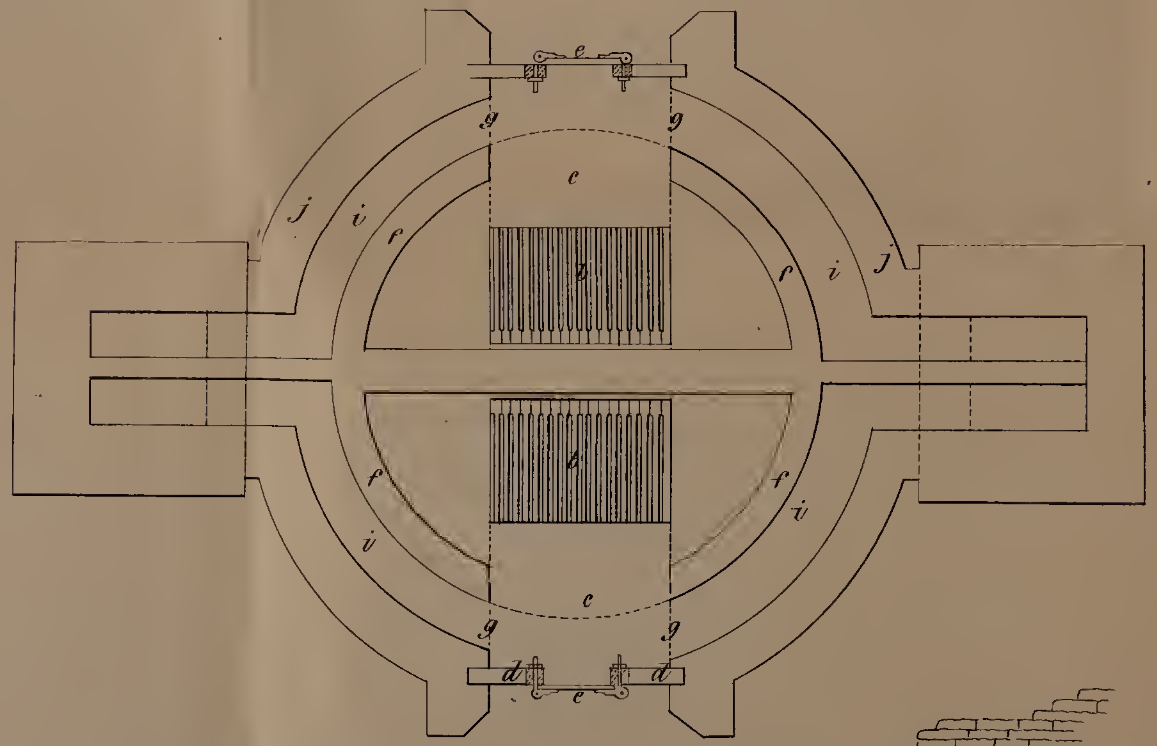


FIG. 4. *Vertical Section of an Engine Boiler, and Furnace.*

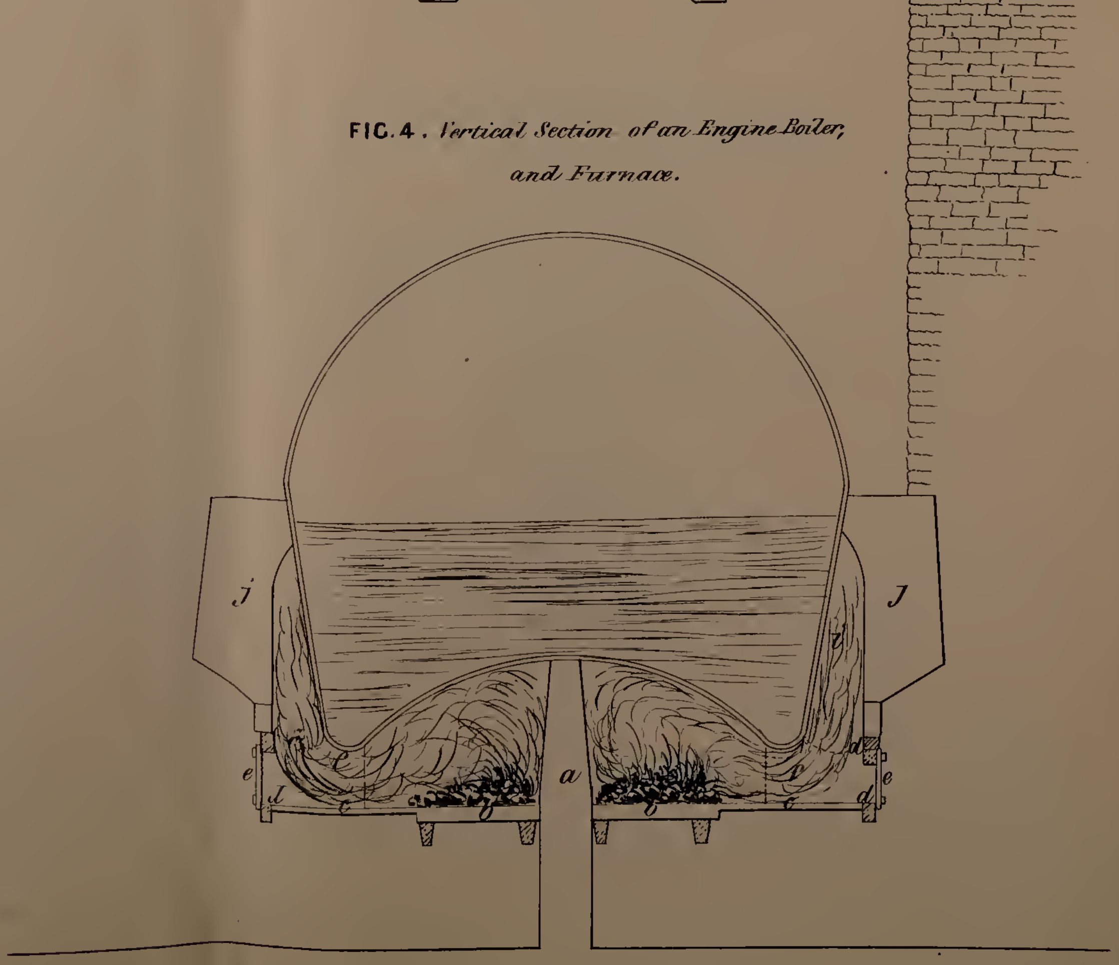


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FIG 10. *Transverse Section of Fig 8.*

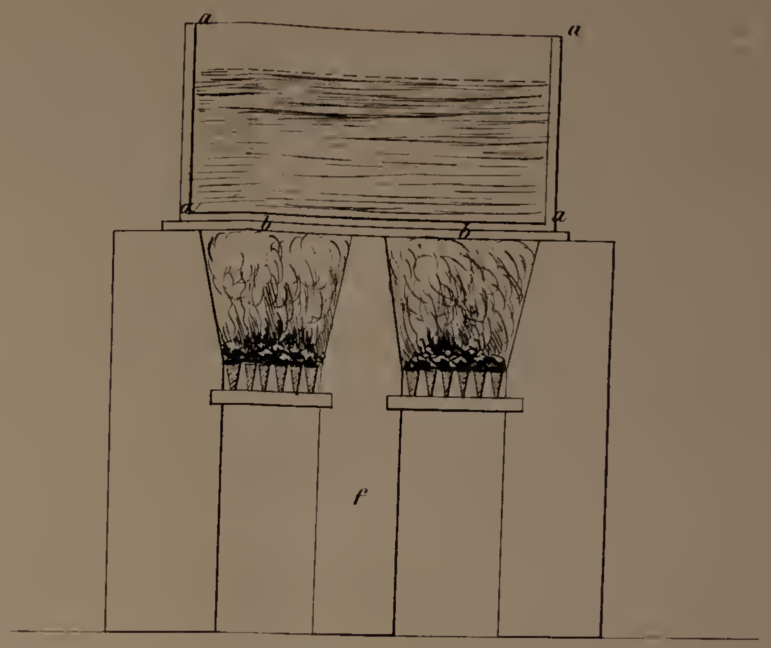


FIG. 9. *Plan of Fig. 8.*

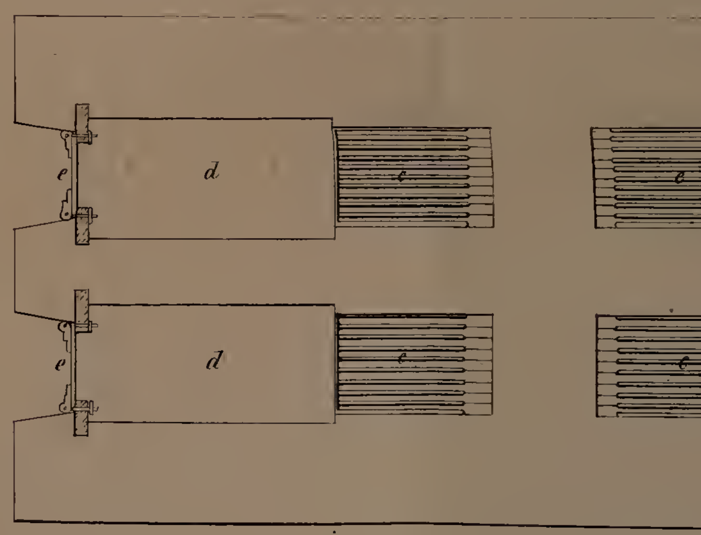
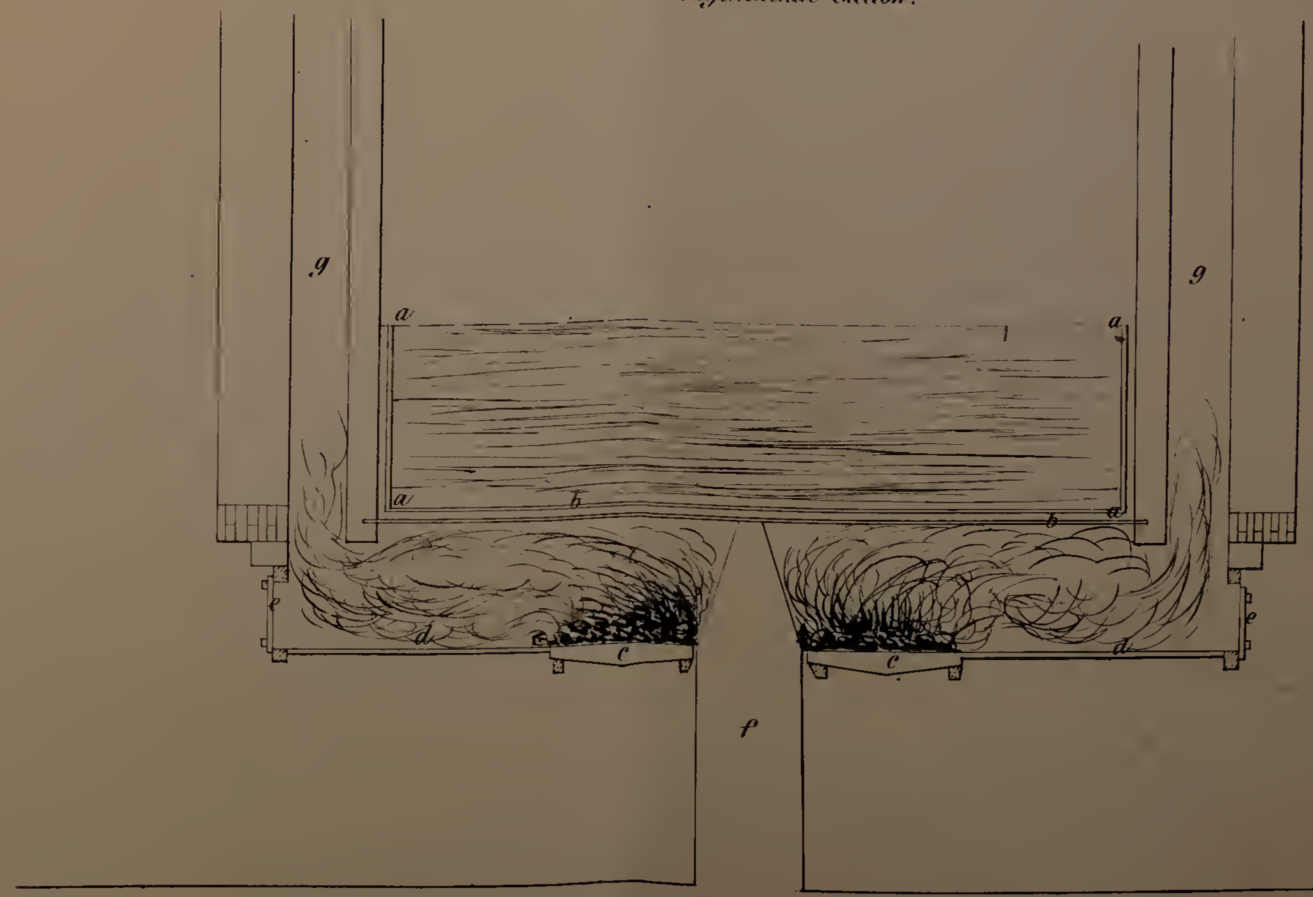


FIG. 8. *Longitudinal Section.*



Scale ½ in. to a foot.

The enrolled drawing is partly colored.

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Malby & Sons, Lith.

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SHEET 2.
2 SHEETS

FIG. 13. *Transverse Section of Fig 11.*

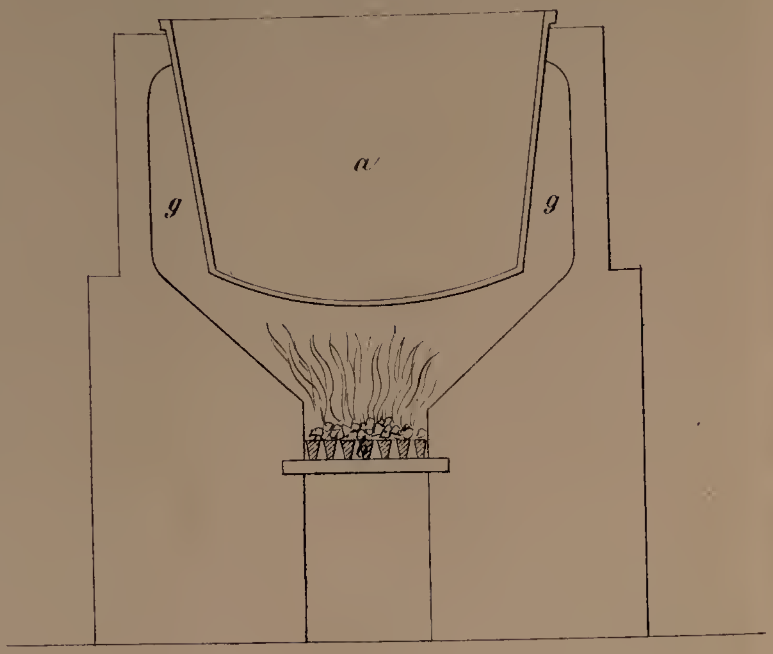


FIG. 18. *Transverse Section of Fig 16.*

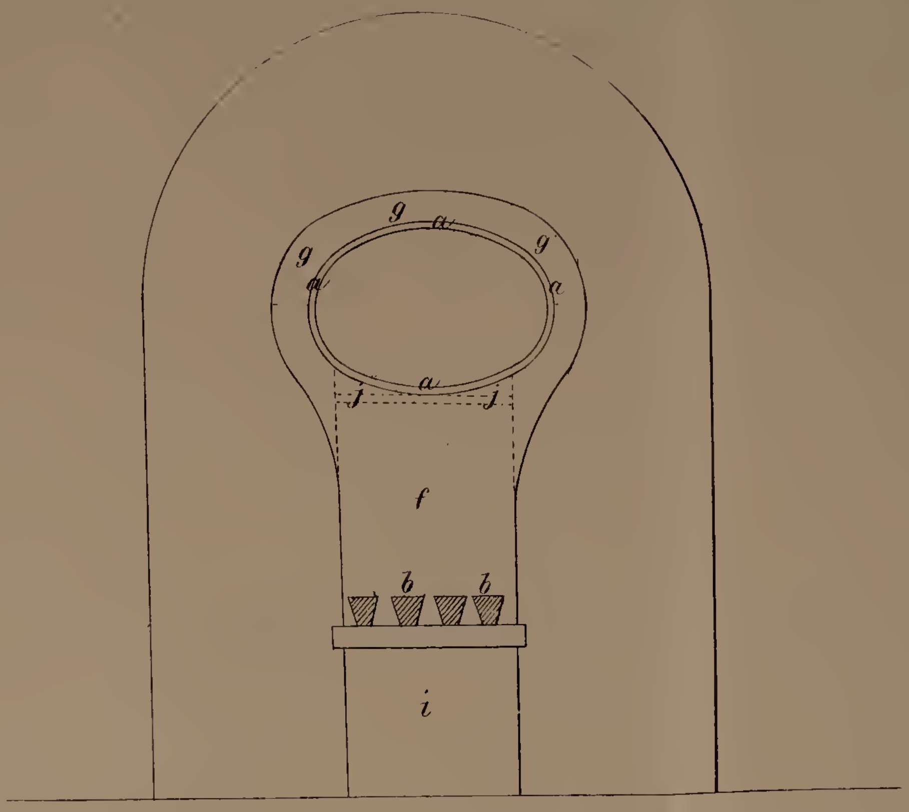


FIG. 12. *Horizontal Section of Fig 11 at* A A.

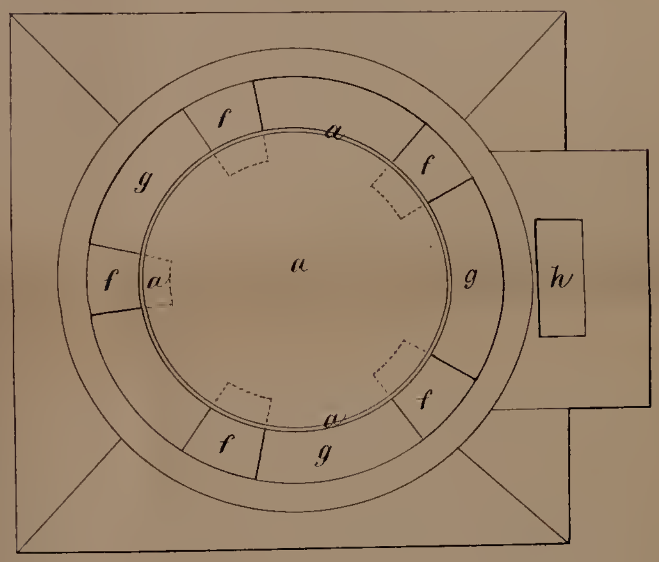


FIG. 17. *Horizontal Section of Fig. 16 at A.A.*

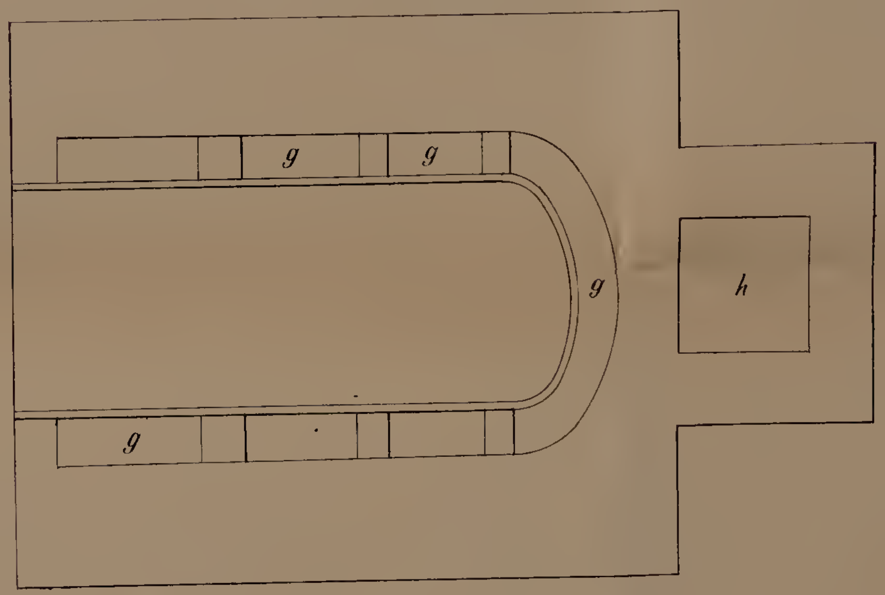


FIG. 15.

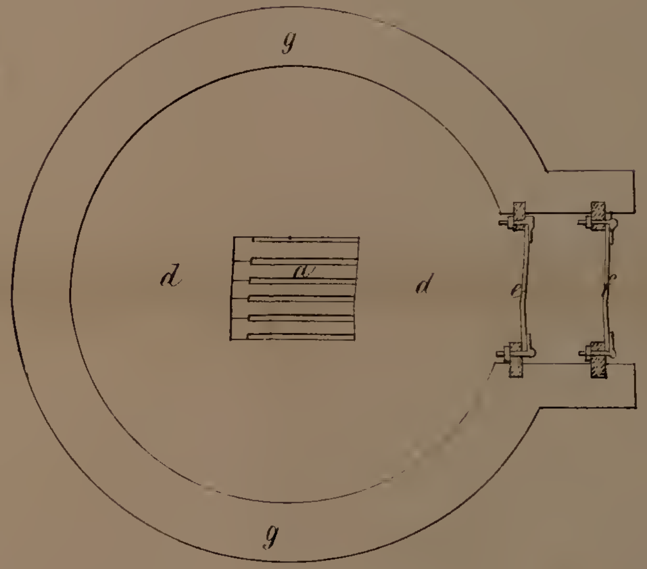
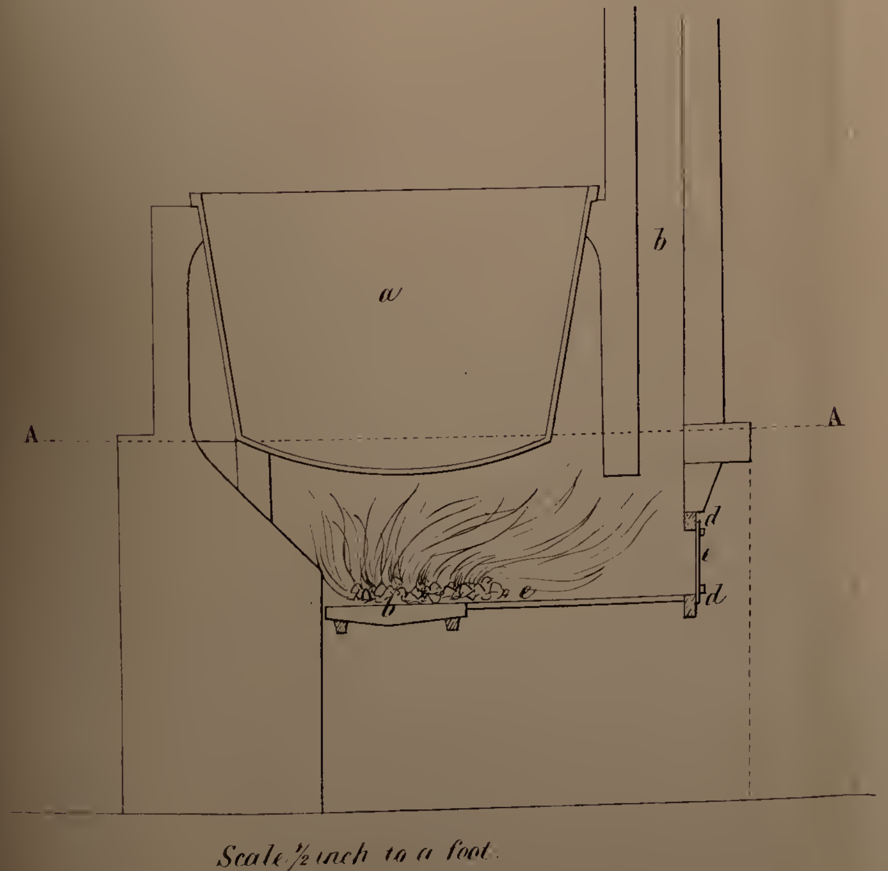


FIG. 11. *Vertical Section*



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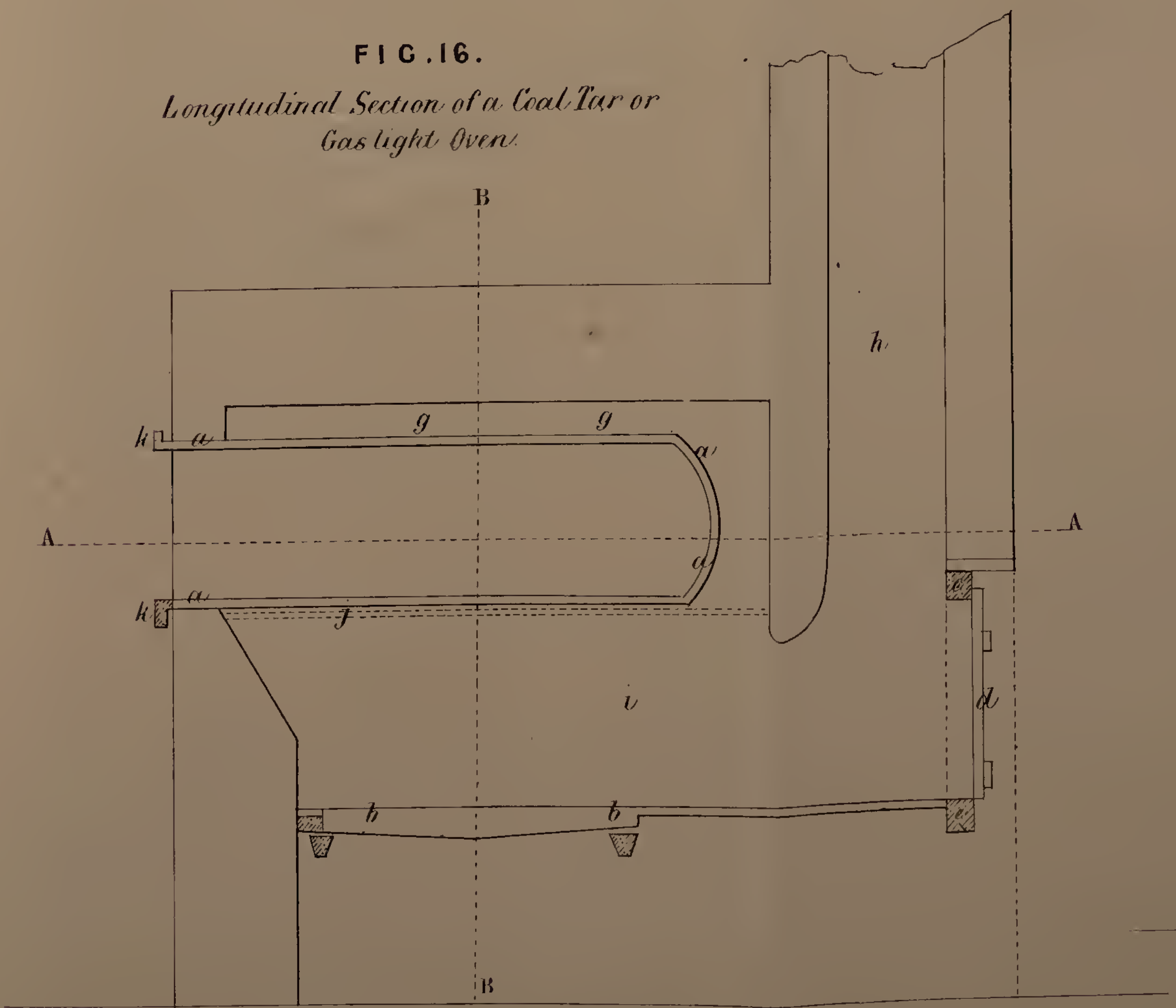
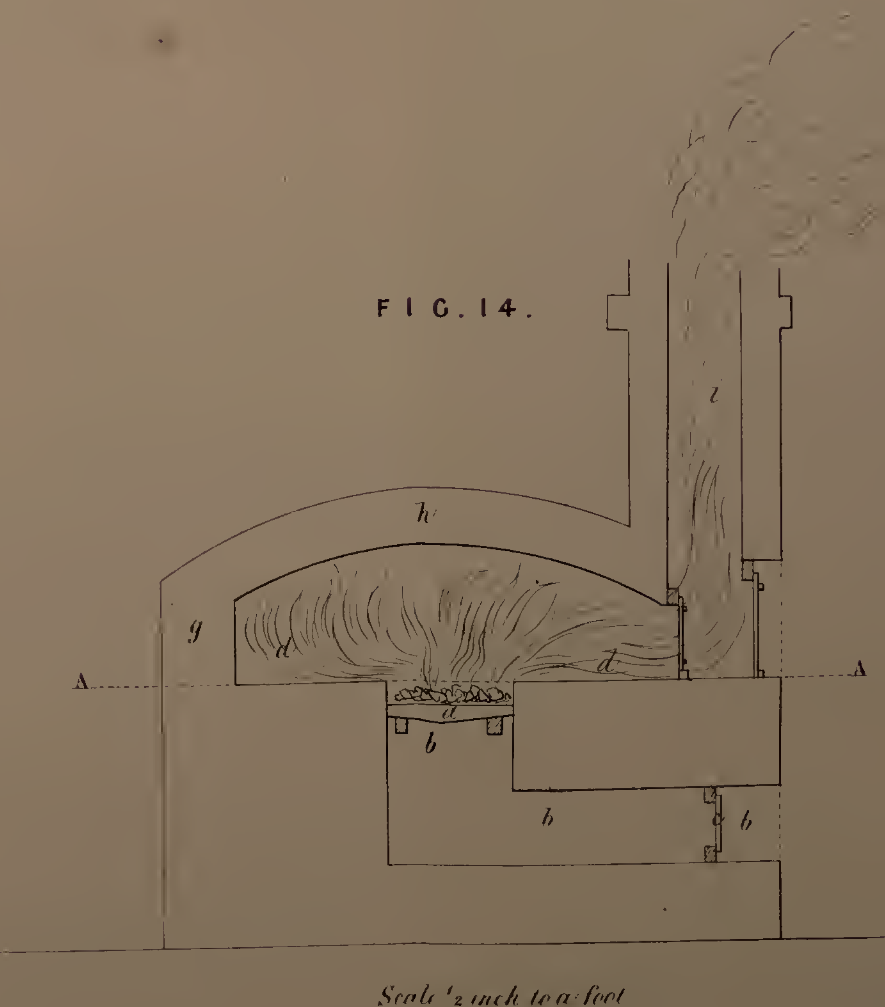
The enrolled drawing is partly colored.

FIG. 16.
Longitudinal Section of a Coal Tar or Gas light Oven



Scale 1 inch to a foot.

FIG. 14.



Scale ½ inch to a foot.

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Printers to the Queen's most Excellent Majesty. 1854.

On the above plan all manner of small boilers and pans may be placed which require the heat to be applied to the sides as well as the bottom; also all kinds of stills, sugar pans or boilers, soap pans, and boilers for evaporating alkaline, and other saline solutions, and for precipitating the salts they contain, &c., it being understood that the dimensions of the plan must be adapted to the boiler or pan to be placed upon it. Steam-engine boilers and other large boilers may also be placed on this plan, but the application of two furnaces has the advantage of diffusing the heated gases more equally over the surface to be heated, and the seperation wall is of great use in supporting the bottom of the boilers. By dividing the grate room into three or four or more spaces, seperated from each other by walls, and each space containing a furnace, the advantages of a still more equable diffusion of the heated gases, and of a more effectual support to the boiler would be obtained, and in placing very large boilers I mean to adopt that arrangement. In that case the form of the area occupied by the bars of the furnace, in place of being a square or parellelogram, may be a trapezoid, a triangle, or any other convenient figure. Fig. 14 represents a vertical section of a vaulted oven, into which the cold air of the atmosphere cannot penetrate during the process of heating. Figure 15 represents an horizontal section of the same at the line A, A. *a, a, a,* in the two Figures shew the bars on which the fuel burns; *b, b, b,* the ash-hole and air duct; *c,* the door which shuts out the air when the oven is sufficiently heated, but which is open during the heating; *d, d, d, d,* the floor or bottom of the oven; *e,* the door through which the fuel is introduced, and through which the heated gasses have their exit after acting on the bottom, sides, and top of the oven; this door is open during the process of heating, and closed after the bread, &c. is introduced; *f,* a door through which the fuel is also introduced, and which is kept closed during the greatest part of the process of heating, in order to cause a stronger current of air to penetrate through the burning fuel. Figure 16 represents a vertical section of a coal tar or gas light or calcining oven, where the cold air is prevented from mixing with the heated gases until after they have ceased to act on the oven. Figure 17 represents an horizontal section of Figure 16 taken at A, A. Figure 18 represents a transverse section of Figure 16, taken at B, B. *a, a, a, a,* in Figures 16, 17, and 18, shew the oven; *b, b, b, b,* grate or furnace bars; *c,* flooring plate, or plate between the ash-pit and grate room; *d,* fire door; *e, e,* fire door frames; *f,* grate room; *g, g, g,* space for heated air, nearly enveloping the oven; *h,* the chimney; *i,* the ash-pit; *j, j, j,* in Figures 16 and 18, shew where a plate of cast metal or other substance on an arch might be introduced, if found necessary, to prevent the intense action of the heated gases immediately above the fire from injuring the oven or retort; *k*, *k*, flanches, upon which the mouth piece of the oven may be fixed or a door put on. On this principle ovens for cooking food, calcining wood into charcoal, bones for making ivory black, and various other purposes, may be constructed.

In witness whereof, I, the said William Losh, have hereunto set my hand and seal, this Twenty-seventh day of May, in the year of our Lord One thousand eight hundred and fifteen.

W^{M} (L.S.) LOSH.

Signed, sealed and delivered (being first duly stamped) in the presence of us,

ROB^{T} WALTERS.
N. W. TODD.

Walters, Extra.

AND BE IT REMEMBERED, that on the Twenty-seventh day of May, in the year of our Lord 1815, the aforesaid William Losh came before our said Lord the King in His Chancery, and acknowleged the Specification aforesaid, and all and everything therein contained and specified, in form above written. And also the Specification aforesaid was stampt according to the tenor of the Statute made for that purpose.

Inrolled the Thirty-first day of May, in the year of our Lord One thousand eight hundred and fifteen.

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